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## NOTES ON THE DESCRIPTION OF LAND FORMS—XI

### **The Physical Features of Morocco.**

LE MAROC PHYSIQUE. By Louis Gentil. 320 pp. F. Alcan, Paris, 1912.

The distinguished explorer of Morocco, Louis Gentil, Professor of Geology at the Sorbonne, has lately prepared a serviceable summary of the physical features of that country, to the knowledge of which he has so largely contributed. Certain chapters of his book will afford geographers excellent information regarding matters of fact, and will at the same time exhibit the manner in which the division of their science that is concerned with land forms is treated by an expert geologist. The book opens with a brief empirical description, excellent of its kind, in which the larger physiographic divisions of Morocco are concisely set forth. Then follow nearly 30 pages regarding the growth of scientific knowledge of that country, over 60 pages on its geological history, and 60 more on the rôle of the two Moroccan mountain systems in the orography of North Africa; the larger system being the Atlas, consisting of several ranges which extend southwest from Algiers to the Atlantic, and the smaller one being the Rif (or Little Atlas) which forms a curve convex to the south in the northern part of the country, with its western arm pointing to the Strait of Gibraltar, across which it is continued northeastward in the mountains of southeastern Spain. Two chapters on the relief of the surface and the evolution of the drainage lines, of which more below, are discussed in 35 and 40 pages respectively; after which climate, vegetation and soils are allotted chapters of somewhat less length.

A peculiar feature of the chapter on Relief or Surface Forms is found in its geological classification and treatment. Its chief sections are:— (1) Influence of Primary (Paleozoic) folding, under which it appears, for example, that a west-central area, bordering the Atlantic and called the Moroccan Meseta or Tableland, is largely covered with horizontal strata of Secondary or Tertiary age, but that in certain districts the removal of the covering strata reveals an underlying body of folded primary strata, for the most part reduced to a peneplain, yet here and there surmounted by ridges of the most resistant strata. (2) Influence of Tertiary folding; here are placed, for example, the several ranges of the Atlas system, in one of which certain anticlines of Mesozoic strata are well preserved while others are breached along their crest, and hence this range is regarded as "very young" (171); but in treating the complete anticlines as "preserving their original form," the author gives at least some of his readers an under-impression of the erosion that has taken place. (3) Influence of epigenetic movements and great faults; here one finds an account of successive broad elevations and depressions without significant deformation, one of the most recent and interesting examples being that by which a former passage between the Atlantic and the Mediterranean, south of the curved range of the Rif, was laid dry, and a gap in this system between the Rif and the mountains of southeastern Spain was submerged to form the Strait of Gibraltar; brief mention is also made of strong faults of relatively modern date, which limit the central mass of the High Atlas on both sides, but their influence

on the present landscape is not here (177, 181) explicitly stated; only farther on in the chapter on the evolution of drainage is the southeastern fault escarpment said to be "furrowed by deep valleys which follow the line of most rapid slope," while at the opening of the valleys on the piedmont plain the spurs between them terminate in facets, "which testify to the relative youth of the form of the range" (212). (4) Relation of relief to rocks, such as granites, which appear in the High Atlas and form part of its crest; limestones, of which the more resistant beds, where folded in the Atlas ranges, produce a Jura-like topography, emphasized by the dryness of the climate, or where lying horizontal, as in the eastern plateau bordering Algeria, determine tabular forms; while the weaker beds, as in the cover of the Meseta on the west, have softer forms; volcanic rocks, of which one large mass known as Siroua, lies on an elevated granite peneplain in the heart of the mountains, and once resembled Etna of to-day, but is now dissected like the Cantal of central France; and so on, with slates, sandstones and other kinds of strata.

It is to be noted that while the descriptions of surface forms in this chapter sometimes place the present result of erosional processes acting on structural masses in the foreground, prominence is given quite as often to the past action of erosional processes on structural masses; that is, the treatment of the surface is as largely geological as it is physiographic; and further that while technical geological terminology is freely employed wherever wanted, a correspondingly technical physiographic terminology is avoided even where it might be helpful.

The chapter on the evolution of drainage presents many details which serve to amplify and complete the physiographic pictures outlined on earlier pages; but it is a question whether, in order to avoid incompleteness there or repetition here, it would not have been better to treat the problems of relief and drainage together. For example, the earlier description of breached anticlines (171) is now in part repeated in connection with the explanation of their axial valleys, which are here as before said to be "bordered by monoclinal crests" (207); the earlier description of the dissected volcano of Siroua (200) is now partly duplicated in the explanation of its radial valleys (213); and the earlier mention of the laying dry of the ancient strait between the Atlantic and the Mediterranean (178) is now in part repeated in the discussion of its drainage (205). Further, the postponement to this chapter of the statement that "the carboniferous folds have imposed, in the paleozoic region of the Atlas, a general direction on the principal valleys which descend from the crests to the great plain of Haouz" (206), leaves the previous statement regarding the relief of this district (167) essentially incomplete. Physiographic terminology is here again little advanced from its elementary incompleteness in the previous chapter. True, the drainage of the folded limestones in the High Atlas is said to have a very close adjustment to the structure (208), but in the absence of a concisely phrased account of the hard and soft beds involved in the folding, the reader is left with an abstract generality in place of a specific landscape. Again, "It is natural to think that phenomena of capture have been frequent in the evolution of the drainage of the High Atlas" (208), and several examples of capture are mentioned; but usually without concise indication of those significant details of visible existing form, the observation and description of which are both so much favored by the possession of a systematic terminology—

because the possession of such a terminology implies the understanding of the elements of form to which the terms apply. Likewise, the tabular limestone region of the Algerian-Moroccan border, briefly mentioned under limestone reliefs (191) but not referred to in connection with "great faults" (177), is now described as divided into a number of fault blocks, trending E.N.E.—W.S.W., with uplift on the southeast, thus forming a flight of steps with broad tread and relatively small rise (221); it is thus implied that the steps are directly due to faulting, but in the absence of a terminology which discriminates between fault-scarps (due to faulting) and fault-line scarps (due to erosion of a faulted structure) the lack of critical discrimination as to the nature of the steps is expectable. It may, of course, be urged that a volume of a "Nouvelle Collection Scientifique" ought not to be too technical, and that various physiographic terms, the absence of which is here regretted, have therefore been wisely excluded: yet in earlier chapters one finds an abundance of technical geological terms, such as beds with *Pleurotomas*, Burdigalian sediments, calcareous marls with *Harpoceras opalinum*, structures of Caledonian, Hercynian or Armorican trend, which are just as definitely helpful in the paragraphs where they occur as physiographic terms might be in the chapters on relief and drainage where they are now lacking.

To studious readers, interested not only in the geography of Morocco, but also in the development of a thoroughly disciplinary and intelligible method of regional physiographic description by intentional experimentation with many methods, and the eventual selection of one that will best serve the ends in view, Gentil's book is welcome and helpful on several grounds. The first ground is of course the truly intimate acquaintance with many facts of Moroccan structure and form that has been gained by this ardent explorer through his own field work and through comprehensive reading; for manifestly no good experiment in description can be made by one who is ignorant of the things that he wishes to describe. Another ground for gratitude is the thorough test here given to the method of describing surface relief on a geological plan, for the value of such a method can be discovered only by giving it a fair trial, and the fairest trial is secured from an author who likes the method and who publishes the application that he makes of it; but in the present writer's opinion, the result of the trial does not recommend the method for further use in regional geography, because it too frequently requires that several diverse elements of a single landscape, closely associated in their natural occurrence, should be described on far-separated pages in association with systematically similar but geographically distant elements. An additional feature of the author's method is the interesting device of treating the evolution of drainage after and to that extent apart from the description of surface relief; for here again the merit of the device can be measured best by submitting it to a serious test in friendly hands and then publishing the results; but as before, the results do not commend the device for further use in regional description.

Another matter, by no means limited to this book but brought forward by it, is the important problem concerning the best use of local place-names as guides to the location of physiographic features. Place-names abound on Gentil's pages, and as the simple outline map in the text contains very few of them, their location must be looked up elsewhere. This is usually done as a matter of necessity, even as a matter of course by the persistent reader

of geographical essays; the problem here raised involves a difficulty of another kind, namely, the use of a local, little-known place-name as a means of locating a perfectly conceivable physiographic detail. I believe that this is not consistent with the best geographical usage, which demands that—apart from widely known place-names, like Gibraltar—physiographic details should be located in relation to larger physiographic elements, and these again in relation to still larger physiographic features, the general positions of which are stated at the outset, as is done in the first pages of Gentil's book for the chief physiographic provinces of Morocco. After a physiographic detail has thus been located, the little-known place-name associated with it may be introduced; if this order is reversed, the difficulty of forming correct mental pictures of the districts described is greatly increased.

The use of little-known place-names as guides to the location of physiographic features adds to the difficulty in books which, like Gentil's, have no index. Consider, for example, the statement that granitic rocks extend from the crests of the High Atlas almost to "Tazenakht" (180). This name being unknown to many readers, the extension of the granites is vague as to direction and distance: therefore a rapid search may be made for Tazenakht (few readers have time for a careful search) through the earlier pages descriptive of the High Atlas, and if it is not found there, it must be looked for on such large-scale map of Morocco as may be accessible. In my own case, the name "Tasenacht" was found on a German map; it appears to be a village lying, as might well have been said in the text, "about 60 kilometers southeast of the mountain crest on the border of the Saharan plateau" (a feature previously explained): thereupon the extension of the granitic area becomes sufficiently definite. The addition of phrases like the one here suggested would increase the size of the book, and its intelligibility as well.

Finally comes the problem of verbal description without the aid of diagrams. There are only two black and white maps of small scale, and no sections or figures in "Le Maroc Physique"; hence the insufficiency of graphic aids must be regarded as its chief defect. The reader would be greatly assisted in understanding, for example, the general relation of the Saharan plateau to the southeastern slope of the Atlas by means of a section, or still better by a block diagram; no such assistance being given, the relation remains uncertain and the reader unsatisfied.

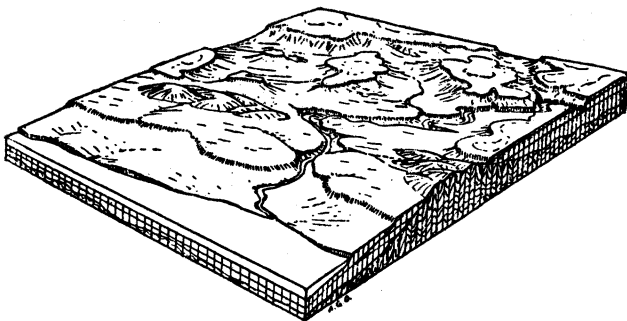
### Theory and Use of Block-diagrams.

LA THÉORIE DU BLOC-DIAGRAM. By Paul Castlenau. *Bull. Soc. de Topog. de France*, Vol. 36, 1912. 16 pp.

Apropos of the closing lines of the preceding note, attention may be called to the above-cited article on the theory and method of construction of block diagrams, from which an increase in the use of this graphic device by French geographers may be hoped for. The discussion of the theory is, however, limited mostly to the geometrical elements of formal perspective, and the representation of non-geometrical surface forms is unfortunately but little considered. The essay closes with excellent advice:—"The chief thing is to make a beginning, without allowing oneself to be discouraged with the first unfruitful trials."

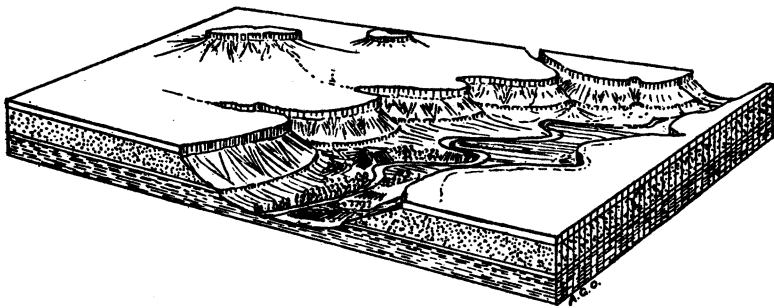
NOTES ON MOROCCAN GEOGRAPHY. By A. G. Ogilvie. *Geogr. Journ.*, Vol. 41, 1913, pp. 231-237.

Ogilvie here returns to a subject he has already treated ("Morocco and Its Future," *Geogr. Journ.*, Vol. 39, 1912, pp. 554-569), following Gentil; but while his previous article had no illustrations, the present one is embellished by a number of good photographs by the French explorer and elucidated by several diagrams. Two of these show in simplified bird's-eye views the leading features of relief before and after the formation of the Strait of Gibraltar; the drawing is rude but immediately helpful. Two others are block diagrams, here



Landforms of the Meseta border and coastal plain.

reproduced; the smaller one, which might well have been a little larger, so as to use the whole breadth of the page instead of wasting space in blank paper, presents the leading features of the Meseta; namely, tabular forms ("Gour") of dissected horizontal strata, through which rise rounded ridges ("Sokhrat") of the resistant foundation rocks; while a simple coastal plain slopes from a series of abandoned sea cliffs in the western margin of the Meseta to the



Form of a valley in the Meseta.

Atlantic sea cliffs of to-day. The other diagram exhibits on a larger scale the tabular Meseta traversed by an open valley, in which water is "usually to be found, either as a running stream or more commonly oozing out as springs from the valley sides." If Gentil's book had contained a number of such block-diagrams its value would have been thereby much increased.

**Physiography as a Basis of Political History.**

THE BALKAN PENINSULA. By D. G. Hogarth. *Geogr. Journ.*, Vol. 41, 1913, pp. 325-336.

One of the reasons for regretting the geological scheme of geographical description in Gentil's book, noticed above, is that it does not provide a sufficiently connected picture of physiographic districts, which might afterwards serve as a basis for historical, political or economic studies. The same may be said of many geomorphological studies of the modern German school, in which regional physiographic phrases are often so deeply buried in a mass of geological detail as to discourage any historian or economist from searching them out; it is difficult enough for a geographer to find them! Perhaps it is because of the relative unfitness of modern physiographical material, that so little use of it is made as a basis for studies in other subjects where geographers at least believe it might be useful.

On the other hand, the kind of physiographical basis that some writers do use in their historico-political studies is in certain aspects disappointing, to say the least. Consider, for example, the paper cited at the head of this note. It is an anthropogeographical address by an expert who has devoted the last twenty-five years with little intermission to the exploration, chiefly archeological, of the Near East, and who here proposes to "state the influence which geographical conditions . . . have had on the societies of this Balkan area . . . To do this one must take account of history to some extent; but only so far as history has been conditioned by geography." The interest of the address in the present connection lies in the method adopted in the description of the physical features by which Balkan history is believed to have been conditioned. That a speaker before a general audience should employ a very elementary and wholly empirical method of physiographic description is proper enough, even if the audience represents the general membership of one of the most distinguished geographical societies in the world, for such audiences have no technical understanding of scientific geography; but whether an elementary empirical style should be preserved in the printed record of the address, when published in a leading geographical journal, is open to question. Still, much of the description seems to be sufficiently intelligible for the author's purpose. For example, after describing the so-called peninsula as divided by mountain ranges into several north-south belts, the author says that the greater part of Albania in the western belt consists of "a series of long and very narrow valleys running across . . . from an almost impassable mountain spine at the eastern frontier to the sea, which is fringed with inhospitable malarious strips filling short intervals between high rocky spurs. The flanking ridges confining the valleys are very high and steep. These features are most fully developed in central Albania." Farther south are "short lateral ranges curving back from the main eastern spine and enclosing small plains."

The phrasing of the descriptions is, however, too often vague and variable; if such deficiencies are hardly avoidable in a spoken address, they are easily corrected in its printed form. The use of two terms for one thing, as when the "narrow valleys" that cross the western belt are later described as "long transverse furrows," violates the fundamental principle of using only one term for one thing. Such a phrase as "ranges curving back from the spine" is so indefinite that it must lead to various mental pictures in the minds of

various hearers; "spine" as here used of course means "backbone," and not such a spine as was temporarily formed on Mt. Pelée. "Rough and shaggy hills" and "shaggy hill country" are truly suggestive expressions, but most readers in applying the latter phrase to the dissected uplands west of the Bosphorus will overrate their ruggedness. But the most ill-judged terms are found in the description of certain north-south and east-west mountain ranges as "vertical" and "horizontal"; as if the speaker were a poorly taught school-boy talking about a map hanging on a wall, instead of a practiced traveler describing the country that he has repeatedly traversed. The phrases in which these blunders occur are as follows:—"The southern part of the peninsula, which is very largely mountainous, displays two orographic features, which have exercised a constant influence on its history and will always control its destiny. In the first place the main lines of its mountainous structure are disposed vertically . . . from northward to southward. In the second place, the slopes leading up to the horizontal mountain system which divides it from the northern part of the peninsula . . . are much steeper than the slopes downwards on the north side of the range . . . Each of the main vertical belts—four in number—into which the peninsula is divided, is marked out by nature, therefore, either to be an independent self-contained unit, or to be combined" etc. That an address delivered in a hall which the speaker referred to as a "temple of exact geography" should describe mountain ranges as "vertical" and "horizontal" is simply amazing. One would think that even a proof-reader might have corrected such errors as these.

The general geographical elements of position and distance by which the Balkan peninsula is related to neighboring countries are well treated in the earlier pages. One of the economic lessons exemplified by several instances falls under the well-known rule that movement tends to follow open lowland paths and that it is blocked by high and rugged mountain barriers. The chief political lesson is that a rough country develops clannishness among the inhabitants of its depressions and basins, and makes centralized government difficult. Both of these lessons would, I believe, have been more effectively taught, had greater emphasis been given to the generality of the rules under which the local instances fall. An interesting ethnic lesson is that religious communion exerts more control than race in grouping the population; but this seems independent of physiographic factors. A point of more physiographic import is that "whatever the Powers may wish, or the Balkan allies extort, or the Turks contrive," the scientific frontier between the parts of Europe and Asia here adjoining lies, not along the water passages between the Black Sea and the Mediterranean, but about fifty miles farther west where the open Rumelian lowland breaks the uplands in which the narrow "trough-like gap" of the Bosphorus and the Dardanelles, in good part drowned river valleys, are relatively narrow interruptions. No wonder that the address was listened to with "enrapt interest" and characterized as "very lucid and instructive," for it treats historical and political topics of live importance to-day; but as anthropogeography it is disappointing in being so largely "anthropic" and so little geographic.

W. M. DAVIS.